



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

Address: COMMISSIONER FOR PATENTS

P.O. Box 1450

Alexandria, Virginia 22313-1450

www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/584,307	06/23/2006	Shinya Tanaka	2006_0832A	9023
513 7590 09/17/2008 WENDEROTH, LIND & PONACK, L.L.P. 2033 K STREET N. W. SUITE 800 WASHINGTON, DC 20006-1021				
EXAMINER				
MC CULLEY, MEGAN CASSANDRA				
ART UNIT		PAPER NUMBER		
1796				
MAIL DATE		DELIVERY MODE		
09/17/2008		PAPER		

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/584,307

Applicant(s)

TANAKA ET AL.

Examiner

Megan McCulley

Art Unit

1796

Period for Reply -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 20 August 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3-8 and 10-12 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3-8 and 10-12 is/are rejected.
- 7) ☒ Claim(s) 1,3-8 and 10-12 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/003)
- Paper No(s)/Mail Date 8/20/2008
- 4) ☐ Interview Summary (PTO-413)
- Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Claim Objections

Claims 1, 3-8 and 10-12 are objected to because Ar is an art recognized symbol for an aromatic group, while in the claims it does not represent an aromatic group.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 3 and 10 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

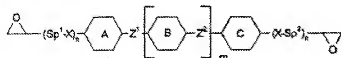
Claim 3 and dependent claim 10 depend on claim 2, which is a canceled claim. For the purpose of further examination, claim 3 is taken to be dependent on claim 1.

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 1, 3, 5, 7, and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Joliffe et al. (GB 2338240) in view of Bezborodov et al. (Liquid crystalline 1,4-disubstituted cyclohexenylene derivatives, Journal of Liquid Crystals, Sept. 17, 1998).


Regarding claims 1 and 3: Joliffe et al. teaches the compound:




(page 6, line 25) in which Sp^1 and

Sp^2 can be $(\text{CH}_2)_o$ where o is 2-12 (page 13, lines 20-25), X can be O (page 5 line 32), n can be 1 (page 5 line 27), Z^1 and Z^2 can be single bonds (page 5 lines 20-25), m can be 1 (page 5 line 26) and groups A, B, and C can be 1,4-cyclohexenylene or 1,4-phenylene (page 5 lines 15-16). It is further disclosed the instance where A is phenylene, B is 1,4-cyclohexenylene, and C is phenylene (page 8, 2-11, line 25).

Not disclosed is where the double bond occurs in the 1,4-cyclohexenylene ring, i.e. ring B. However, Bezborodov et al. teaches that liquid crystals with a 1,4-

cyclohexenylene derivative  produces higher values of nematic-isotropic liquid phase transition temperature ($T_{\text{N-I}}$) and crystal-nematic phase transition temperature ($T_{\text{C-N}}$) and a lower value of the nematic range (ΔT) than liquid crystals with a 1,4

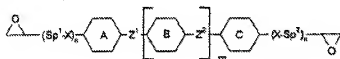
cyclohexenylene derivative  (See table 2, section 2 paragraphs 1 and 2, table 3 and section 2 paragraph 6). Joliffe et al. and Bezborodov et al. are analogous art because they are both concerned with the same field of endeavor, namely liquid crystal polymers with 1,4 cyclohexenylene rings. At the time of the invention a person having ordinary skill in the art would have found it obvious to combine the double bond placement disclosed in Bezborodov et al. with the polymer disclosed in Joliffe et al. and would have been motivated to do so for such desirable properties as higher working temperatures which may be necessary for some applications.

Regarding claims 5 and 10: Joliffe et al. teaches a polymerization initiator/curing agent (page 20 lines 10-12).

Regarding claim 7: Joliffe et al. teaches a crosslinked/cured product (page 19 lines 30-35).


Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Joliffe et al. (GB 2338240) in view of Bezborodov et al. (Liquid crystalline 1,4-disubstituted cyclohexenylene derivatives, Journal of Liquid Crystals, Sept. 17, 1998) in further view of Mormann et al. (U.S. Pat. 5,569,727).


Regarding claim 4: Joliffe et al. teaches the compound:



(page 6, line 25) in which Sp^1 and

Sp^2 can be $(CH_2)_o$ where o is 2-12 (page 13, lines 20-25), X can be O (page 5 line 32), n can be 1 (page 5 line 27), Z^1 and Z^2 can be single bonds (page 5 lines 20-25), m can be 1 (page 5 line 26) and groups A, B, and C can be 1,4-cyclohexenylene or 1,4-phenylene (page 5 lines 15-16). It is further disclosed the instance where A is phenylene, B is 1,4-cyclohexenylene, and C is phenylene (page 8, 2-11, line 25).

Not disclosed is where the double bond occurs in the 1,4-cyclohexenylene ring, i.e. ring B. However, Bezborodov et al. teaches that liquid crystals with a 1,4-cyclohexenylene derivative  produces higher values of nematic-isotropic liquid phase transition temperature (T_{N-I}) and crystal-nematic phase transition temperature

(T_{C-N}) and a lower value of the nematic range (ΔT) than liquid crystals with a 1,4 cyclohexenylene derivative  (See table 2, section 2 paragraphs 1 and 2, table 3 and section 2 paragraph 6). Joliffe et al. and Bezborodov et al. are analogous art because they are both concerned with the same field of endeavor, namely liquid crystal polymers with 1,4 cyclohexenylene rings. At the time of the invention a person having ordinary skill in the art would have found it obvious to combine the double bond placement disclosed in Bezborodov et al. with the polymer disclosed in Joliffe et al. and would have been motivated to do so for such desirable properties as higher working temperatures which may be necessary for some applications.

Not disclosed is the method of making the compound. However, Mormann et al. teaches a similar liquid crystal diepoxide made by a method of reacting the corresponding diol (middle cyclic structures which has two terminal OH groups as does instant formula at the top of page 4 of the claims) with epichlorohydrin (which is of the instant formulas at the top and bottom of page 5 of the claims) in the presence of benzyltrimethylammonium bromide, which is basic (example 1). At the time of the invention a person having ordinary skill in the art would have found it obvious from the teachings of Mormann et al. that to make the compound disclosed in Joliffe et al., the procedure disclosed in example 1 would be modified by replacing the hydroquinone bis(4-hydroxybenzoate) with the diol corresponding to formula at the top of page 4 of the claims. Joliffe et al. and Mormann et al. are analogous art since they are both concerned with the same field of endeavor, namely diepoxy liquid crystals. At the time of the invention a person having ordinary skill in the art would have found it obvious to

combine the method of making disclosed in Mormann et al. to make the compound disclosed in Joliffe et al. and would have been motivated to do so to make a diepoxide liquid crystal with the properties of the Joliffe et al. compound.

Claims 6 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Joliffe et al. (GB 2338240) in view of Bezborodov et al. (Liquid crystalline 1,4-disubstituted cyclohexenylene derivatives, Journal of Liquid Crystals, Sept. 17, 1998) as applied to claims 1 and 5 above and in view of Schoenfeld et al. (U.S. Pat. 6,143,379).

Regarding claim 6: Joliffe et al. teaches the basic claimed composition as set forth above. Not disclosed is the curing agent of 4,4'-diaminodiphenylmethane, 4,4'-diaminodiphenylethane, 1,5-diaminonaphthalene or p-phenylenediamine. However, Schoenfeld et al. discloses a liquid crystal polyepoxy with aromatic constituents (col. 2 lines 37-52) comprising p-phenylenediamine (col. 3 lines 18-25). Joliffe et al. and Schoenfeld et al. are analogous art because they are both concerned with the same field of endeavor, namely liquid crystalline epoxies. At the time of the invention a person having ordinary skill in the art would have found it obvious to combine the curing agent disclosed in Schoenfeld et al. with the composition disclosed in Joliffe et al. and would have been motivated to do so for such desirable properties as pronounced color effects and appearance, as evidenced by Schoenfeld et al. (col. 1 lines 1-30).

Regarding claim 11: Joliffe et al. teaches a crosslinked/cured product (page 19 lines 30-35).

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Joliffe et al. (GB 2338240) in view of Bezborodov et al. (Liquid crystalline 1,4-disubstituted cyclohexenylene derivatives, Journal of Liquid Crystals, Sept. 17, 1998) as applied to claims 1 and 5 above and in further view of McCormack et al. (U.S. Pat. 6,326,555).

Regarding claim 8: Joliffe et al. teaches the basic claimed composition as set forth above. Not disclosed is a prepreg obtained by applying or impregnating the composition to or into a base material followed by semi-curing. However, McCormack et al. teaches a partially cured prepreg comprising liquid crystal epoxy. Joliffe et al. and McCormack et al. are analogous art because they are both concerned with the same field of endeavor, namely liquid crystal epoxies. At the time of the invention a person having ordinary skill in the art would have found it obvious to combine the composition of Joliffe et al. with the product of McCormack et al. and would have been motivated to do so because prepreps are a known epoxy applications considering the adhesiveness and ease of handling of epoxy resins.

Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Joliffe et al. (GB 2338240) in view of Bezborodov et al. (Liquid crystalline 1,4-disubstituted cyclohexenylene derivatives, Journal of Liquid Crystals, Sept. 17, 1998) and in view of Schoenfeld et al. (U.S. Pat. 6,143,379) as applied to claims 1, 5 and 6 above and further view of McCormack et al. (U.S. Pat. 6,326,555).

Regarding claim 12: Joliffe et al. teaches the basic claimed composition as set forth above. Not disclosed is a prepreg obtained by applying or impregnating the

composition to or into a base material followed by semi-curing. However, McCormack et al. teaches a partially cured prepreg comprising liquid crystal epoxy. Joliffe et al. and McCormack et al. are analogous art because they are both concerned with the same field of endeavor, namely liquid crystal epoxies. At the time of the invention a person having ordinary skill in the art would have found it obvious to combine the composition of Joliffe et al. with the product of McCormack et al. and would have been motivated to do so because prepreps are a known epoxy applications considering the adhesiveness and ease of handling of epoxy resins.

Response to Arguments

Applicant's arguments with respect to claims 1, 3-8 and 10-12 have been considered but are moot in view of the new ground(s) of rejection.

However, the following remarks are in regard to applicant's arguments directed to the GB 2338240 reference. Applicant's argument that Joliffe et al. does not teach specific disclosure of the epoxy compound of the present invention is not persuasive. Joliffe et al. teaches a limited number of possible, predictable moieties for each of the variables within the polymer, especially the three ring structures in the exact order as the instantly claimed polymer. Many of the Sp variable choices given in Joliffe et al. overlap with the claimed Q³ group. While the reference does not show the instant structure, the claimed structure is encompassed by the teaching and a person having ordinary skill in the art would recognize there is a finite number of identified, predictable possibilities from which to choose a liquid crystal polymer.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Correspondence

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Megan McCulley whose telephone number is (571)270-3292. The examiner can normally be reached on Monday - Friday 7:30-5:00 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Eashoo can be reached on (571) 272-1197. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Mark Eashoo, Ph.D./
Supervisory Patent Examiner, Art Unit 1796
13-Sep-08

/M. M./
Examiner, Art Unit 1796